جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology

Course Syllabus: Applied Mathematics II - AMCS 202

Division	Computer, Electrical and Mathematical Sciences & Engineering
Course Number	AMCS 202
Course Title	Applied Mathematics II
Academic Semester	Summer
Academic Year	2016/2017
Semester Start Date	06/04/2017
Semester End Date	08/03/2017
Class Schedule (Days & Time)	02:00 PM - 05:00 PM | Mon Thu

Instructor(s)

Name	Email	Phone	Office Location	Office Hours
Jean-Marie Morvan	jean-marie.morvan@kaust.edu.sa	+966128080617 8080617		

Teaching Assistant(s)

Name	Email

Course Information

Comprehensive Course Description	This course is part of a fast-paced two-course sequence in graduate applied mathematics with emphasis on analytical techniques. Review of complex functions. Analyticity, the Cauchy-Riemann equations. Conformal maps. Contour integrals. The Cauchy-Goursat theorem, the Cauchy integral formula. Taylor series, singularities, Laurent series. Classification of isolated singularities. Residues and their applications. Review of linear algebra. Bases, independence. Linear maps, null space, rank, eigenvalues, inner product, norm, condition number. Functions of matrices. Numerical methods for linear algebra problems. Gaussian elimination, LU decomposition. Projections, Gram-Schmidt orthogonalization, and the method of least squares.
Course Description from Program Guide	Prerequisites: Advanced and multivariate calculus and elementary complex variables. AMCS 201 and 202 may be taken separately or in either order. Part of a fast-paced two (2)-course sequence in graduate applied mathematics for engineers and scientists, with an emphasis on analytical technique. A review of linear spaces (basis, independence, null space and rank, condition number, inner product, norm, and Gram-Schmidt orthogonalization) in the context of direct and iterative methods for the solution of linear systems of equations arising in engineering applications. Projections and least squares. Eigenanalysis, diagonalization, and functions of matrices. Complex analysis, Cauchy- Riemann conditions, Cauchy integral theorem, residue theorem, Taylor and Laurent series, contour integration, and conformal mapping. No degree credit for AMCS majors.
Goals and Objectives	In the first part of the course we consider various applications of complex integrals (residues and the computation of improper integrals). In the second part we apply the Fourier and Laplace transforms to solve certain linear ODEs or PDEs. In the third part of the course we study some numerical methods to solve systems of linear algebraic equations
Required Knowledge	Advanced and multivariate calculus and elementary complex variables

Reference Texts	—D. G. Zill, M. R. Cullen: Advanced Engineering Mathematics (3rd edition, 2006) —E. Kreyszig: Advanced Engineering Mathematics (9th edition, 2006) —J. W. Brown, R. V. Churchill: Complex Variables and Applications (9th edition) —G. Strang: Linear Algebra and its Applications (4th edition)
Method of evaluation	**10.00**% - Quiz(zes) **40.00**% - Final exam **25.00**% - Exam 2 **25.00**% - Exam 1
Nature of the assignments	Assignments There will be 8 homework assignments during the semester; the students should work out the details of the problems individually. During the course there will be two midterm exams and a final exam; all exams are closednote, closed-book exams, however, a handwritten formula sheet of size A4 can be used. At the end of the course, a standard letter grade is obtained.
Course Policies	Course Policies Students are expected to attend all classes and exams. They are required to submit every assignment on time. Incomplete grade (I) for the course will only be given under extraordinary circumstances (such as sickness).
Additional Information	

Tentative Course Schedule

(Time, topic/emphasis & resources)

Week/Lecture	Topic
1	Review of complex functions. Analyticity, the Cauchy-Riemann equations. Conformal maps.
2	Contour integrals. The Cauchy-Goursat theorem, the Cauchy integral formula.
3	Taylor series, singularities, Laurent series.
4	Classification of isolated singularities. Residues and their applications.
5	Review of linear algebra. Bases, independence. Linear maps, null space, rank, eigenvalues,
6	Inner product, norm, condition number. Functions of matrices.
7	Numerical methods for linear algebra problems. Gaussian elimination, LU decomposition.
8	Projections, Gram-Schmidt orthogonalization, and the method of least squares.
9	Final Examination
10	N.A.
11	N.A.
12	N.A.
13	N.A.
14	N.A.
15	N.A.
16	
17	
18	

Note

The instructor reserves the right to make changes to this syllabus as necessary.